

Amendments to the Claims

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims

1-30. (Cancelled)

31. (Currently amended) ~~A The mutant SPE-A toxin, of claim 30, wherein the mutant SPE-A toxin comprises~~ two to six amino acid substitutions; and
wherein the substituted amino acids comprise asparagine-20 of SEQ ID NO: 14, leucine-41 of SEQ ID NO: 14, leucine-42 of SEQ ID NO: 14, aspartic acid-45 of SEQ ID NO: 14, cysteine-98 of SEQ ID NO: 14, or substitution at more than one of these amino acids,
wherein the mutant is nonlethal compared to wild type SPE-A toxin.

32. (Currently amended) The mutant SPE-A toxin of claim 31, wherein the substitutions comprise the substitution of asparagine-20 of SEQ ID NO: 14 to aspartic acid, glutamic acid, lysine or arginine; the substitution of leucine-41 of SEQ ID NO: 14 to alanine; the substitution of leucine-42 of SEQ ID NO: 14 to alanine; the substitution of cysteine-98 of SEQ ID NO: 14 to serine, alanine, glycine, or threonine; the substitution of aspartic acid-45 of SEQ ID NO: 14 to asparagine, glutamine, serine, threonine, or alanine; or substitutions at more than one of these residues.

33. (Currently amended) The mutant SPE-A toxin of claim 32, wherein the substitutions comprise asparagine-20 of SEQ ID NO: 14 to aspartic acid, leucine-41 of SEQ ID NO: 14 to alanine, leucine-42 of SEQ ID NO: 14 to alanine, cysteine-98 of SEQ ID NO: 14 to serine, aspartic acid-45 of SEQ ID NO: 14 to asparagine, or more than one of these substitutions.

34. (Currently amended) The mutant SPE-A toxin of claim 31, wherein the substitutions comprise substitution of asparagine-20 of SEQ ID NO: 14, of cysteine-98 of SEQ ID NO: 14, or of both asparagine-20 of SEQ ID NO: 14 and cysteine-98 of SEQ ID NO: 14.

35. (Currently amended) The mutant SPE-A toxin of claim 34, wherein the substitutions comprise asparagine-20 of SEQ ID NO: 14 to aspartic acid, cysteine-98 of SEQ ID NO: 14 to serine, or both asparagine-20 of SEQ ID NO: 14 to aspartic acid and cysteine-98 of SEQ ID NO: 14 to serine.

36. (Currently amended) The mutant SPE-A toxin of claim 34, further comprising substitution of aspartic acid-45 of SEQ ID NO: 14, lysine-157 of SEQ ID NO: 14, or of both aspartic acid-45 of SEQ ID NO: 14 and lysine-157 of SEQ ID NO: 14.

37. (Currently amended) The mutant SPE-A toxin of claim 36, wherein the substitutions comprise aspartic acid-45 of SEQ ID NO: 14 to asparagine or lysine-157 of SEQ ID NO: 14 to glutamic acid.

38. (Canceled)

39. (Currently amended) The mutant SPE-A toxin of claim ~~31~~ 38, wherein the substitutions comprise the substitution of asparagine-20 of SEQ ID NO: 14 to aspartic acid, glutamic acid, lysine or arginine; the substitution of leucine-41 of SEQ ID NO: 14 to alanine; the substitution of leucine-42 of SEQ ID NO: 14 to alanine; the substitution of cysteine-98 of SEQ ID NO: 14 to serine, alanine, glycine, or threonine; the substitution of aspartic acid-45 of SEQ ID NO: 14 to asparagine, glutamine, serine, threonine, or alanine; or substitutions at more than one of these residues.

40. (Currently amended) The mutant SPE-A toxin of claim 39, wherein the substitutions comprise asparagine-20 of SEQ ID NO: 14 to aspartic acid, leucine-41 of SEQ ID

NO: 14 to alanine, leucine-42 of SEQ ID NO: 14 to alanine, cysteine-98 of SEQ ID NO: 14 to serine, aspartic acid-45 of SEQ ID NO: 14 to asparagine, or more than one of these substitutions.

41. (Currently amended) The mutant SPE-A toxin of claim 38, wherein the substitutions comprise substitution of asparagine-20 of SEQ ID NO: 14, of cysteine-98 of SEQ ID NO: 14, or of both asparagine-20 of SEQ ID NO: 14 and cysteine-98 of SEQ ID NO: 14.

42. (Currently amended) The mutant SPE-A toxin of claim 41, wherein the substitutions comprise asparagine-20 of SEQ ID NO: 14 to aspartic acid, cysteine-98 of SEQ ID NO: 14 to serine, or both asparagine-20 of SEQ ID NO: 14 to aspartic acid and cysteine-98 of SEQ ID NO: 14 to serine.

43. (Currently amended) The mutant SPE-A toxin of claim 41, further comprising substitution of aspartic acid-45 of SEQ ID NO: 14, lysine-157 of SEQ ID NO: 14, or of both aspartic acid-45 of SEQ ID NO: 14 and lysine-157 of SEQ ID NO: 14.

44. (Currently amended) The mutant SPE-A toxin of claim 43, wherein the substitutions comprise aspartic acid-45 of SEQ ID NO: 14 to asparagine, lysine-157 of SEQ ID NO: 14 to glutamic acid, or both aspartic acid-45 of SEQ ID NO: 14 to asparagine and lysine-157 of SEQ ID NO: 14 to glutamic acid.

45. (Currently amended) The mutant SPE-A toxin of claim ~~31~~ 30, wherein the mutant has at least one of the following characteristics: the mutant has a decrease in mitogenicity for T-cells, the mutant does not enhance endotoxin shock, the mutant is not lethal, or the mutant is nonlethal but retains mitogenicity comparable to that of the wild type SPE-A toxin.

46. (Currently amended) A vaccine for protecting animals against at least one biological activity of wild-type SPE-A comprising: an effective amount of ~~at least one mutant~~

SPE-A toxin according to claim 30 a mutant SPE-A toxin comprising two to six amino acid substitutions; and

wherein the substituted amino acids comprise asparagine-20 of SEQ ID NO: 14, leucine-41 of SEQ ID NO: 14, leucine-42 of SEQ ID NO: 14, aspartic acid-45 of SEQ ID NO: 14, cysteine-98 of SEQ ID NO: 14, or substitution at more than one of these amino acids,

wherein the mutant is nonlethal compared to wild type SPE-A toxin.

47. (Currently amended) A pharmaceutical composition comprising: a mutant SPE-A toxin according to claim 30 in admixture with a physiologically acceptable carrier, wherein the mutant SPE-A toxin comprises two to six amino acid substitutions; and

wherein the substituted amino acids comprise asparagine-20 of SEQ ID NO: 14, leucine-41 of SEQ ID NO: 14, leucine-42 of SEQ ID NO: 14, aspartic acid-45 of SEQ ID NO: 14, cysteine-98 of SEQ ID NO: 14, or substitution at more than one of these amino acids,

wherein the mutant is nonlethal compared to wild type SPE-A toxin.

48. (Previously presented) A method for protecting an animal against at least one biological activity of a wild type SPE-A comprising: administering a vaccine according to claim 46 to an animal.

49. (Previously presented) A method for reducing symptoms associated with toxic shock comprising: administering a vaccine according to claim 46 to an animal.

50. (Canceled)

51. (Currently amended) A The mutant SPE-A toxin, of claim 50, wherein the mutant SPE-A toxin comprises one to six amino acid substitutions; and

wherein the substituted amino acids comprise leucine-41 of SEQ ID NO: 14, leucine-42 of SEQ ID NO: 14, aspartic acid 45 of SEQ ID NO: 14, or substitution at more than one of these amino acids,

wherein the mutant is nonlethal compared to wild type SPE-A toxin.

52. (Currently amended) The mutant SPE-A toxin of claim 51, wherein the substitution comprises leucine-41 of SEQ ID NO: 14 to alanine; leucine-42 of SEQ ID NO: 14 to alanine; aspartic acid-45 of SEQ ID NO: 14 to asparagine, glutamine, serine, threonine, or alanine; or substitution at more than one of these amino acids.

53. (Currently amended) The mutant SPE-A toxin of claim 51, wherein the substitution comprises aspartic acid-45 of SEQ ID NO: 14 to asparagine.

54. (Currently amended) The mutant SPE-A toxin of claim 53, further comprising substitution of asparagine-20 of SEQ ID NO: 14, substitution of cysteine-98 of SEQ ID NO: 14, or substitution of both asparagine-20 of SEQ ID NO: 14 and cysteine-98 of SEQ ID NO: 14.

55. (Currently amended) The mutant SPE-A toxin of claim 54, wherein the substitutions comprise asparagine-20 of SEQ ID NO: 14 to aspartic acid, cysteine-98 of SEQ ID NO: 14 to serine, or both asparagine-20 of SEQ ID NO: 14 to aspartic acid and cysteine-98 of SEQ ID NO: 14 to serine.

56. (Canceled).

57. (Currently amended) The mutant SPE-A toxin of claim ~~51~~59, wherein the mutant SPE-A toxin comprises two to six amino acid substitutions; and

wherein the substituted amino acids comprise asparagine-20 of SEQ ID NO: 14, leucine-41 of SEQ ID NO: 14, leucine-42 of SEQ ID NO: 14, aspartic acid 45 of SEQ ID NO: 14, or substitution at more than one of these amino acids.

58. (Currently amended) The mutant SPE-A toxin of claim 57, wherein the substitutions comprise substitution of asparagine-20 of SEQ ID NO: 14 to aspartic acid, glutamic

acid, lysine or arginine; substitution of leucine-41 of SEQ ID NO: 14 to alanine; the substitution of leucine-42 of SEQ ID NO: 14 to alanine; substitution of aspartic acid-45 of SEQ ID NO: 14 to asparagine, glutamine, serine, threonine, or alanine; or substitution at more than one of these amino acids.

59. (Currently amended) The mutant SPE-A toxin of claim 58, wherein the amino acid substitutions comprise asparagine-20 of SEQ ID NO: 14 to aspartic acid, leucine-41 of SEQ ID NO: 14 to alanine, leucine-42 of SEQ ID NO: 14 to alanine, cysteine-98 of SEQ ID NO: 14 to serine, aspartic acid-45 of SEQ ID NO: 14 to asparagine, or substitution at more than one of these amino acids.

60. (Canceled).

61. (Currently amended) The mutant SPE-A toxin of claim ~~5160~~, comprising substitutions at asparagine-20 of SEQ ID NO: 14, at cysteine-98 of SEQ ID NO: 14, or of both asparagine-20 of SEQ ID NO: 14 and cysteine-98 of SEQ ID NO: 14.

62. (Currently amended) The mutant SPE-A toxin of claim 61, wherein the substitutions comprise asparagine-20 of SEQ ID NO: 14 to aspartic acid, cysteine-98 of SEQ ID NO: 14 to serine, or both asparagine-20 of SEQ ID NO: 14 to aspartic acid and cysteine-98 of SEQ ID NO: 14 to serine.

63. (Currently amended) The mutant SPE-A toxin of claim ~~5150~~, further comprising a substitution at a cysteine.

64-71. (Canceled).

72. (Currently amended) The mutant SPE-A toxin of claim ~~5150~~, wherein the mutant has at least one of the following characteristics: the mutant has a decrease in mitogenicity for T-

cells, the mutant does not enhance endotoxin shock, the mutant is not lethal, or the mutant is nonlethal but retains mitogenicity comparable to that of the wild type SPE-A toxin.

73. (Currently amended) A vaccine for protecting animals against at least one biological activity of wild-type SPE-A comprising: an effective amount of at least one mutant SPE-A toxin according to claim 50 comprising one to six amino acid substitutions; and wherein the substituted amino acids comprise leucine-41 of SEQ ID NO: 14, leucine-42 of SEQ ID NO: 14, aspartic acid 45 of SEQ ID NO: 14, or substitution at more than one of these amino acids,

wherein the mutant is nonlethal compared to wild type SPE-A toxin.

74. (Currently amended) A pharmaceutical composition comprising: a mutant SPE-A according to claim 50 in admixture with a physiologically acceptable carrier, wherein the mutant SPE-A toxin comprises one to six amino acid substitutions; and wherein the substituted amino acids comprise leucine-41 of SEQ ID NO: 14, leucine-42 of SEQ ID NO: 14, aspartic acid 45 of SEQ ID NO: 14, or substitution at more than one of these amino acids,

wherein the mutant is nonlethal compared to wild type SPE-A toxin.

75. (Previously presented) A method for protecting an animal against at least one biological activity of a wild type SPE-A comprising: administering a vaccine according to claim 73 to an animal.

76. (Previously presented) A method for reducing symptoms associated with toxic shock comprising: administering a vaccine according to claim 73 to an animal.

77-80. (Canceled).

81. (Currently amended) The mutant SPE-A toxin of claim 31 ~~77~~, further comprising amino acid substitutions at residue lysine-157 of SEQ ID NO: 14.

82. (Currently amended) The mutant SPE-A toxin of claim 81, comprising amino acid substitutions lysine-157 of SEQ ID NO: 14 to glutamate and asparagine 20 of SEQ ID NO: 14 to aspartic acid.

83. (Currently amended) The mutant SPE-A toxin of claim 31 ~~77~~, comprising amino acid substitutions at residues asparagine-20 of SEQ ID NO: 14, leucine-41 of SEQ ID NO: 14, leucine-42 of SEQ ID NO: 14, aspartic acid-45 of SEQ ID NO: 14, and cysteine-98 of SEQ ID NO: 14.

84. (Canceled)

85. (Currently amended) The mutant SPE-A toxin of claim 83 ~~84~~, comprising amino acid substitutions of residue asparagine 20 of SEQ ID NO: 14 to aspartic acid, leucine-41 of SEQ ID NO: 14 to alanine, leucine-42 of SEQ ID NO: 14 to alanine, aspartic acid-45 of SEQ ID NO: 14 to asparagine, and cysteine-98 of SEQ ID NO: 14 to serine.

86-101. (Canceled).